

RECORDED  
Clerk's File Copy Case 786

THE MAGNAVOX COMPANY, et al., )  
Plaintiff, )  
vs. ) No. 74 C 1030  
CHICAGO DYNAMIC INDUSTRIES, et al., ) and  
Defendants ) 74 C 2510

Before the Honorable JOHN F.GRADY  
Judge

Monday, January 10, 1977

10:15 a.m.

Parties met pursuant to adjournment.

PRESENT:

MR. ANDERSON  
MR. WILLIAMS

MR. GOLDENBERG  
MR. RIFKIN

FILED

MAR 2-1977

H. Stuart Cunningham, Clerk  
United States District Court

THE CLERK: 74 C 1030, consolidated with  
74 C 2510, Magnavox v Chicago Dynamics, case on trial.

THE COURT: Good morning, gentlemen.

MR. ANDERSON: Good morning, your Honor.

MR. GOLDENBERG: Your Honor, at this time I  
would like to give the Court back its Exhibit 13.  
We have added to that exhibit pages that the plaintiffs  
wish added with respect to the depositions.

THE COURT: All right.

MR. GOLDENBERG: Then I would like to substitute  
for the Court Defendants' Exhibit 10, which is the  
Space War. We have added to this one the pages that  
the plaintiffs wanted.

MR. ANDERSON: As long as we are taking care  
of housekeeping, your Honor, I will hand up to the Court  
the Plaintiff's Exhibit 101, the portions of the deposition  
of Nolan K. Bushnell, which the plaintiff designated,  
and this includes the defendants' counterdesignations  
now also.

THE COURT: All right.

MR. ANDERSON: The same is true with respect  
to Plaintiff's Exhibit 102, portions of the deposition  
of William T. Rusch, and Plaintiff's Exhibit 103, por-  
tions of the deposition of William L. Harrison.

THE COURT: Gentlemen, this is an enormous

amount of material for me to read. Is it all, in your view, going to be helpful to me?

I can see that there is a better part of a day's reading here probably.

MR. ANDERSON: Your Honor, on behalf of the plaintiffs, with respect to Harrison and Rusch, we put that in as corroboration for Mr. Baer's testimony. I think there is no need to read it, unless there is some challenge by Mr. Goldenberg with respect to some specific incident or event.

With respect to Mr. Bushnell's testimony, it is shorter, but even so, I think, based upon the summary which I gave you, which I think was just historical and undisputed, plus the portions I read to the Court, I think that is the only reason that we have put the Bushnell transcript in at this time.

THE COURT: I would say that if I have the gist of the testimony already by way of counsel's agreed representations as to what the testimony is -- not necessarily that you agree with the truth of it, but that that is what these witnesses said -- I doubt that there would be any nuances that I would get by reading it that would materially assist me in deciding the case.

MR. GOLDENBERG: This is my view, your Honor. I think with respect to Mr. Bushnell's testimony, it was

offered in connection with the plaintiff's copying case.

If I state that incorrectly, Mr. Anderson --

THE COURT: On the Pong?

MR. GOLDENBERG: On the Pong matter.

MR. ANDERSON: And the fact that Mr. Bushnell had the experience, which I summarized, in the computer field and the amusement game field and the TV field as early as 1965, I believe.

THE COURT: I think I will read the material in regard to the Space War, at least the deposition on that, and the depositions on the RCA, unless you think, again, that is something that only would be cumulative.

MR. GOLDENBERG: Your Honor, there are stipulations with respect to both of those games. The stipulations, however, go to the dates and locations. They do not, however, go into any great detail as to what the games were.

With respect to the RCA game, the Court may recall that it saw the film, and perhaps would not find it necessary to read the RCA depositions from that point of view.

What else Mr. Anderson has with respect to the portions that he added in RCA is of course something I do not know, or what he believes they show.

MR. ANDERSON: Well, we added portions to the RCA record, your Honor, that emphasized the fact that at the 25th anniversary demonstration at the Sarnoff Center, both their television engineering department and their computing engineering department were displaying at the same time at the same place, that they were highly skilled in television receiver design and, in fact, RCA is probably, at least the domestic U.S. leader, maybe the world leader, in television.

Nevertheless, they prepared a report on the use of computers in the home, including perhaps the possibility of playing games, and that report is one of the exhibits, and it shows that they thought it was 5, 10 years off and would be prohibitively expensive if it were not capable of doing many other things.

We put in our counterdesignation for those purposes.

MR. GOLDENBERG: Well, your Honor, I think it is sort of clear that there is perhaps more to this than either side agrees together. As I see, we do have a central agreement on sort of the who --

THE COURT: Who said what?

MR. GOLDENBERG: -- on who said what and when they said it, and where they said it.

But the implications of it, however, are matters --

THE COURT: I will take a look at this material. I think maybe what we will do is I will take a little longer lunch break today than usual and use that time to read through that material, at least portions of it.

MR. GOLDENBERG: The essential purpose of our addition of Space War, of our original inclusion of Space War, was since we had an agreement on the who and the where, we wanted to tell the Court the what, just what Space War. That is what we intended to show.

MR. ANDERSON: Mr. Brown, as to the Michigan demonstration, testified that it took approximately one man year, or up to one man year, to program that computer for that display. That is another reason that we put in the portion of the RCA record. The testimony there was it took 120 man days, therefore, to program their Spectra 70/25 Computer for that one demonstration.

With respect to Space War, I think, your Honor, the primary counter designation that we have put is to go to the point of this so-called bounce version, where there is absolutely no documentary record of any kind of a bounce version. That is all testimony after the fact, and I think the cases are clear that that is not an adequate basis for proving up an item of prior art.

THE COURT: Let me return to you the old version of Plaintiff's Exhibit 101.

MR. ANDERSON: With regard to all three of those games, we put in portions that to show all three of the computers were over-taxed, even though they were monstrous machines and expensive. They did all they could do and

would not have been able to do what was done in much simpler form when the Sanders group made the TV game invention.

THE COURT: Well, I will read through at least portions of that material over the lunch hour.

I am not sure what the state of the record is on the question of computer capability as of the date of the alleged inventions here. I indicated I felt that the prior art designations made by the plaintiffs within the statute precluded any discussion of the 1968 capabilities of the computers. I thought about that over the weekend, and I am inclined to think I was wrong about that.

It seems to me that 1954 and later pool games taught that computers could be used in connection with cathode ray tubes to play games on screens, and it seems to me that that teaching necessarily applies to whatever the state of the computer technology is at any particular time.

To the extent that if by my ruling on last Thursday I may have indicated that I did not want Mr. Holt to testify to what the computer technology was as of the date of plaintiff's inventions, I am going to reverse myself. I am not really sure that I did keep out anything that the defendants wanted to put in, because I do recall there was some testimony about the small chip --

MR. GOLDENBERG: Your Honor, we did want to develop that point further.

THE COURT: All right, I am going to permit you to do that because I think it would be error to keep that out.

MR. ANDERSON: Your Honor, I think our objection goes to any specific references to any other alleged specific games that were programmed for some other demonstrations. I think we were entitled to know what specific events the defendant was relying upon.

THE COURT: I think that is true, and I don't really think there are any other specific events.

MR. GOLDENBERG: There are no other specific events, your Honor.

THE COURT: The progress in computers between 1954 and 1968, I think, is a matter of relevance.

MR. ANDERSON: Again, I think that is perhaps true, except that if there is a specific event that they now contend --

THE COURT: No, they aren't going to put in any specific event.

MR. ANDERSON: I don't mean a game, but some other specific event, I think the same is true if it is to go to build up a combination, as I think the witnesses have testified.

There is no contention, as I understand it, by defendant that there is an anticipation of any claim of either '598 or '507 reissue patents. They have to combine various prior art to try to make it a case for obviousness.

They have combined, as I understand the testimony, the '480 disclosure plus one of these demonstrations on one of the three computers, and if they want to combine some --

THE COURT: One of the things they are entitled to put into their combination is a computer, and I am just saying that the computer they are entitled to put into the combination is a 1968 computer rather than a 1954 computer.

MR. ANDERSON: I respectfully would submit that not unless there is some suggestion that that particular computer was recognized or recognizable for its application, but I think we can best face that when it arises as an issue. I don't think we can discuss it in the abstract very effectively.

THE COURT: I suppose the time to go into it would be on redirect examination. I will give you leave to reopen the direct examination at that time to develop that point any further, Mr. Goldenberg.

MR. GOLDENBERG: Thank you, your Honor.

ARTHUR W. HOLT,

called as a witness by the defendants herein, having been previously duly sworn, was examined and testified further as follows:

THE COURT: Good morning, Mr. Holt.

THE WITNESS: Good morning, sir.

CROSS-EXAMINATION (Continued)

BY MR. ANDERSON:

Q Mr. Holt, on Thursday, you gave some testimony about using a piece of string to measure a distance and compared that to using a tape measure. Do you recall that testimony?

A Yes, I do.

Q I think your suggestion was that the piece of string was analog and the tape measure was digital. Was that the purpose of that particular testimony?

A I think it is a close thing. If I was holding, say, this much, and you are going to use that to go up to a person and say, "Well, he is taller than this piece of string," in that sense it would be analog. Then if you put marks on it and count them, then that would be a digital way. I had, you know, 19 marks, just exactly this much each, and that would be a change of that piece of string to a digital method of measuring.

Q But in both cases, the length of the string

or tape measure is the analog of the height of the person, is that correct?

A No.

Q Why isn't the length of the piece of string the analog of the height of the person?

A If I take a piece of string, a roll of string, and I come up to my son Arthur, and then I put it up to him and I cut it off at the top just exactly where it hits his head, and then I take that same piece of string over to my daughter Katherine and hold that up against her and I say, "Now, Katherine is taller than Arthur because the string doesn't reach up to the top of her head," that is the analog.

That is a use of analog measurement to show a difference.

Q In the ultimate use of a digital, are you saying you would have to be using the marking to saying "Sarah is two marks shorter than Arthur;" is that the point?

A Katherine.

Q Katherine, excuse.

Is that your point?

A Essentially that is correct, and not only that, I can do this at long range.

If I have a standard tape measure, that is to say, I know the distance between marks on a string, then I can say on a standard string with standard marks, Arthur is 19. Then I send that over to San Francisco where Katherine is, and then it turns out Katherine is 21.

So I can do that even though I don't have the same piece of string so long as they are standard marks.

Q In the accused games, you want to measure the distance down from the top of the screen to where, say, the player symbol starts, as shown in Plaintiff's Exhibit 87. That would be measured by a piece of string or a tape measure, is that right?

A That's correct.

Q You would use the zero end of the piece of string or tape measure and you would use the other end to determine how far down that spot appears, is that correct?

A Yes. In the analog method -- what you have said,

I am sure, is just right.

Q      Similarly that length of the piece of string or the tape measure is an analog of the time delay from vertical sync until the first sign occurs that displays the player symbol, is that right?

A      No, Mr. Anderson. The whole use of having two contrasting words is to be able to show on one hand one kind of thing, mostly one kind of thing, and on the other hand, the other kind of thing. So we have these two words which have a dichotomy. One of them is analog and the other is digital.

There are places here which it is clearly mostly one, and there is a little grey area in between, but on the other hand we over the last 30 or 40 years have built up a very concise idea, I mean efficient idea, of what we mean when we say analog, on the one hand, and what we mean on the other hand.

So if you are going to take a piece of string without marks and measure the distance from the top and say, "Okay, I am going to move my panel down until the top of it just reaches the end of this piece of string," because that is what it was some other place, that is the analog method of doing it.

If on the other hand I say, "I am going to use standard marks on a string or a tape measure," then I don't have to have that particular piece of string. I can,

using a standard marked string, measure it in California and I can measure that in this courtroom by counting marks, and that is what we in the business, the computer business or the electronic business, mean by the difference between analog and digital. That is what we mean by it.

Q With respect to Plaintiff's Exhibit 87, the time diagram at the top as compared to the picture of the TV display at the bottom, isn't it true that the length of time from the vertical sync to the first horizontal line where this spot is displayed corresponds to the distance down from the top of the field to where the spot begins to display?

A I think you are saying it the way -- yes, that is true.

Q That is true of both the accused games and the patented games?

A The length of time, is that your critical -- would you try me again?

MR. ANDERSON: Would you read the last question and answer to the witness, please?

(Whereupon the record was read by the reporter as requested.)

BY MR. ANDERSON:

Q Now, that is true of both the accused games and the patented games in '507 and '598, is it not?

A It is quite true that if you actually did measure the time, and it is time that you are measuring in the analog thing -- you really do measure time -- in the digital one you are counting actual horizontal lines. That is what you do.

Now, the fact that they both come out, as a matter of fact, having the same length of time difference between the vertical sync and the place it comes, is sort of after the fact. It is really not really what happened.

Q In both cases it is the number of lines that occur before the first line where the spot occurs after vertical sync?

A That's correct. In a digital one we are counting the lines rather than measuring time.

Q So the answer to my question was yes, it is the same in the defendants' games and in the patented games?

A I didn't say that, sir. I said after having done it, you would find that the length of time that had elapsed was nearly the same.

Q Looking at the output of the defendants' game

board and looking at the output of the game boards of the patents, that output would have the general configuration shown at the top of Plaintiff's Exhibit 87, would it not?

A That is the video output, isn't it, unmodulated?

Q Well, what is it as you see it, Mr. Holt?

A I believe that is a video output, something that would be hooked to a monitor rather than to an input of a television receiver.

Q The patent teaches that a video output, just like shown in Plaintiff's Exhibit 87. Both patents teach that, do they not?

A Yes. However, that is not a digital drawing waveform there. That is an analog waveform.

Q In both?

A Yes.

Q So that the defendants' games have an analog waveform at this point as well as the patented games?

A And several other places.

Q Several other places?

A Yes. The potentiometers, for example.

Your Honor, the controls for both the defendants' game and the plaintiff's games are very similar, potentiometers developing analog voltages. At that point they are very closely the same. They are

not generated the same for that output. The ball bounce, of course, is quite a difference in the defendants' games, and to that extent the waveforms are not similar.

Q I will place the Plaintiff's Exhibit 91-A on the easel. When you say the potentiometers in the accused games are analog, you are referring to the left and right game potentiometers as shown in the upper left-hand corner of the Paddle Ball circuit diagram?

A Yes, I am.

Q The device which determines where the paddle begins is a 555 timer, is that correct?

A May I ask do we have the same diagram?

Q Plaintiff's Exhibit 91-A.

A Yes.

Q Now, these analog potentiometers in the accused games feed a 555 timer, is that correct?

A That's correct.

Q And that is also an analog device?

A This is an interesting case, your Honor, of a device which is a little digital and a little analog. It is one of these crossover points. It turns out that it is measuring time here by means of what we call an RC time constant. So it is measuring time. However, the outputs are in general not -- I mean they are either zero volts or a specific voltage in terms of output of that 555 circuit.

So it is really a sort of hybrid, and there are a few examples like that.

Q And the RC time constant generates like a sawtooth voltage, is that correct?

A No. An RC time constant in general is exponential.

Q If you take a small part of it, isn't it relatively straight?

A Well, it obeys an e to the X law, meaning that it is always curved and doesn't ever quite get to where it would like to go. It is one of these things that is always trying to get somewhere. The longer you give it, the closer it gets to this value, but it never quite gets there.

Q So the sawtooth might not be perfectly straight. It might have a slight curve to it.

A No one would use that for a sawtooth, I believe. It is very unusual. It is very poor engineering, I would think.

Q Is it better called a ramp?

A No.

Q It rises from a low value at a rate to a higher value?

A No. A sawtooth for use in these kinds of things, you want to have this time horizontally to be very uniform. That is to say every microsecond you would like that to have it move a specific amount.

Otherwise the picture gets peculiar. The guy's nose gets too long, or the size of his forehead changes as he moves from the left side of the screen to the right.

So you have to have a nearly perfect sawtooth. That is to say it is very uniform.

Now, the RC time constant is distinctly not that.

Q And it is the RC time constant that the accused games use in converting the manual potentiometer to a location of the paddle up or down the screen, is that correct?

A I am sorry. Hit me again.

Q In the accused games there is an RC time constant determined by the resistors and the capacitors shown within the purple outline on Plaintiff's Exhibit 91-A.

A That's right.

Q And it is that RC time constant in part at least that converts the position that the player puts in on his analog potentiometer into a vertical position of the paddle, the top of the paddle on the screen, is that correct?

A Yes.

Q So you are saying in the accused games that it is not a perfectly linear relationship, that the potentiometer might cause the paddle to move up more at the top or more at the bottom for a given amount of rotation than at the other end of the screen.

A Certainly it is theoretically possible.

Q So it kind of just a matter of player rotating it and seeing where it is, and if he likes it, he leaves it there? It is not a linear relationship, a calibrated rotation of the knob to produce an increment, like a digital step or anything like that.

A I don't think we should mix up what the word "sawtooth" means.

Q I am not putting this in the context of sawtooth.

A The really important one is the one that determines the way the beam moves across the cathode ray tube. This particular time constant, the input to the 555, controls where the paddle is vertically. It doesn't have to be a sawtooth.

Q Now, in the accused games there is an oscillator down in the lower right-hand corner, and from that oscillator the horizontal sync pulses are taken, is that correct?

A I think that is right, yes.

Q To that extent the patents in suit have a similar horizontal sync source, which is an oscillator, is that correct?

A Horizontal sync sawtooth generator 116?

Q Yes.

A Yes.

Q Sync and sawtooth, I believe.

A Yes. In red.

Q So it does have a horizontal sync generator, and that is an oscillator, am I correct?

A You can certainly call it an oscillator.

Q In both of the patents in suit?

A No.

Q Just referring to the patents in suit, Mr. Holt, if you will.

A The patents in suit have a horizontal sync sawtooth generator, and it is free running, as I remember it, which would come under our terms of an oscillator. It is not sine wave oscillator.

Q And that horizontal sync generating oscillator acts as a clock to tell the game to put a new horizontal sync pulse approximately every 30th of a second or so, is that correct?

A No. Your Honor, this is exactly a good example -- this is a place where you can make a good distinction again between analog and digital.

Q Are you saying the answer to my question is no?

A No --

MR. GOLDENBERG: Mr. Anderson, may the witness have time to complete his answers to your questions?

MR. ANDERSON: I want to know what the answer to the question is. Then he can explain it.

BY THE WITNESS:

A The answer is that they do not operate the same way --

BY MR. ANDERSON:

Q That is not my question, Mr. Holt.

A And the defendants' circuit, as a matter of fact, does not, the clock here, does not, is not the horizontal sync generator.

Q Am I wrong when I say that the horizontal sync pulse is derived directly from that clock just by dividing it down, where the dock starts out maybe at, on 1 $\frac{4}{5}$  megahertz, and you divide it down to get a horizontal sync pulse of 15,750 . 50 kilohertz?

A This is precisely the difference between an analog and a digital circuit.

Q Is the answer to my question yes?

THE COURT: He is not asking the difference. He is asking is this true in the patents in suit?

THE WITNESS: The clock in the defendants' circuit is not the horizontal sync generator.

THE COURT: He is not asking you about the defendants' circuit. He is asking you about the plaintiff's.

THE WITNESS: In the plaintiff's circuit the horizontal sync sawtooth generator, as a matter of fact -- its output does deliver a sawtooth, which is the horizontal sawtooth.

Q And a sync pulse also?

A That's correct.

Q It does both? They are both clocked out at 1000 plus --

A It puts out, the plaintiff's patent here, puts out one sync pulse for each horizontal, and it also puts out a sawtooth. But it is just one horizontal synchronizing pulse per line across the television.

Q That is in the '507 patent, right?

A I believe in the '598 also.

Q In the '598? What is the purpose, as you understand it, of the sawtooth that is generated in the generator's 115 and 116, those oscillators?

A Well, in the '507 -- well, first we have got the control box, which is mostly stuff that are in the patents being contested. Then over here you have a television set.

So in '507 they have a sawtooth generator shown there, because they are going to use that actually in developing the horizontal position of the paddle. In '598 they don't really need the sawtooth appearing in the control box, because they are going to use time in '598.

They didn't like the way the slicer worked. It didn't work very well, the '507 slicers, so they went back in '598 to something where you are measuring time more directly.

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They didn't like the way the slicer worked. It didn't work very well, the '507 slicers, so they went back in '598 to something where you are measuring time more directly.

Q And there is only a periodic clock sync pulse generated in the horizontal sync and vertical sync 103 and 102, no sawtooth, am I correct, in the '598 patent?

A I believe so. There certainly doesn't seem to be any need for it.

Q Now, Mr. Holt, during your direct examination you referred to your participation in certain computer activities at the Bureau of Standards on a computer which I think you said was called SEAC.

A Yes.

Q I think you said that was dedicated in 1950?

A I think it was May or June of 1950, yes.

Q At page 1651 I think you said that was the first programmed computer. That is not correct, is it?

A No. The record is wrong, or else I misspoke. It is called the first stored program computer.

Q There were several computers in use prior to the SEAC, am I correct, including the EDVAC and the ENIAC?

A If you go back to 1930, you can get two or three, but the most important one prior, the most important prior computer in the U.S. at least, was called the ENIAC, which was a fixed program computer for generating ballistic tables during the war. It is a very famous computer. But it could not modify its operation as a result of earlier operations, and that is quite a distinction.

Freddy Williams at Manchester, England, beat us be two months on the stored program computer, as to who did it first in the word. But we were the first in the U.S.

Q The EDVAC was a stored program?

A That was not operating successfully at that time.

Q When was work done on the EDVAC, do you know.

A The EDVAC was a very slow moving computer in getting going. It came along rather gradually, and its operation didn't really begin until -- I have a IEEE publication on that subject if you would like to enter that into the record, or anything.

Q I think your answer is adequate and explains the situation.

Now, you testified on direct examination that the wall generator of a visible wall is the main difference between the '598 patent and the '507 patent. Do you recall that?

A I believe I testified that.

Q There are other differences between those two patents, am I correct?

A I don't think that there are any significant differences in terms of what is disclosed in the patent and claimed. That is certainly the only thing that really stands out.

Q I think you have just testified on cross here that the '507 patent used a slicer circuit which was perhaps less satisfactory and less stable and the '598 patent used a more stable timed pulse circuit which was different; am I correct?

A It is a different circuit inasmuch as -- it certainly is a different circuit.

Q A different circuit, but your point is that it was just two different circuits and it wasn't claimed in any of the claims in suit and, therefore, you didn't consider it to be a main difference or important?

Am I correct that that is what you just said?

A Frankly, the fact that that type of horizontal sync generator -- I did get a little confused. '480, of course, uses the same type basically of a horizontal delay as the '598, and in between that came the '507, which was a different one.

So I think that if we go from '507 to '598, there is a difference in the way they generate

their time delays -- it is a circuitry difference -- and there is a difference, of course, that they display the ball in '598 and do not display it in '507.

Q You say that the '480 used a somewhat similar circuit. There are differences, important differences, between the '480 and the '598 circuitry, aren't there?

A For the horizontal sync generator?

Q No, not for the horizontal sync generator, for the spot generator.

A The spot generator, '480 does not teach ball bounce.

Q Right, I realize that the '480 doesn't disclose any circuit, does it, for automatically moving a ball or producing any bounce or interaction between two balls by which one changes its direction of motion. None of that is in '480; am I correct?

A I don't remember any method for automatically moving the ball.

Q The '480 patent does teach to locate a player symbol on the screen and to enable the player to manipulate that symbol; am I correct?

A Yes.

Q That circuit in '480 is different from the circuit the player manipulates to locate his paddle in '598, is it not?

A It is a little different. They are both RC time constant kinds of things, and where they are using again this exponential circuit, your Honor, to make a delay, a manually controlled delay furthermore.

Q What is the important difference, if any, that you recognize in the circuit for generating the symbol and manipulating it in '480 as compared to the different circuit of the '598 patent?

A I would like to have the two drawings side by side, if I may, to answer that.

Q Do you have any recollection?

A I would really like to have the drawings because they are really only detail differences.

Q Do you have any recollection of a specific difference in the way in which the two are controlled?

A As I say, the differences are so minute, I would really want to see the drawings side by side. They are philosophically the same kind of circuit.

Q Doesn't the '598 patent use a control voltage to determine the time delay between the sync pulse and the player or ball pulse, a variable voltage?

A I really would like to refresh my memory, if you don't mind, and look at the circuits.

Q No, it is all right if you don't recall.

You testified, Mr. Holt, that there is

something in this record called Bounce Space War;  
do you recall?

A Yes.

Q Did you find any document or any physical evidence at all with respect to any game or demonstration called Bounce Space War?

A My information on that is from the depositions, and in the depositions, the people who were deposing talked and described a variation called Bounce Space War.

Q Just the oral testimony?

A That is where my information comes from on Bounce War.

Q You testified that in Bounce Space War, something appeared to bounce off of a fixed visible symbol. Do you recall saying that?

A No, I don't. If I didn't, I said something very close to it.

My only problem here is whether I said it was visible or not. I honestly don't think that in the versions -- there were a lot of versions of Space War. Every computer program had a lot of fun with it.

I think that the early versions do not have a display showing the edge, but I think that they testified that some people did put one in when they had it bounce off there.

All I am doing is relying on my memory of those depositions.

Q So if the depositions prove that you are wrong, then you would not say that there was a fixed visible wall off of which anything bounced in the demonstration called Space War?

A I do not have any independent knowledge of what went on there. I am trying to recall as best I can what the depositions said.

Q You said at page 1690, in response to a question regarding the computer demonstrations;

"A Well, Space War had a number of options. These

"again were computer people playing in their off times and making games and they -- one of the versions they had were their projectiles that they sent whizzing after the enemy would as a matter of fact bounce off of a side."

Is it your understanding that there was no visible symbol or wall or line on any Space War demonstration off of which anything bounced, or is it the contrary?

A My own memory is that it was said that it sometimes had it displayed and sometimes didn't have it displayed, according to what programmer had inserted what option.

I could be wrong on that, but I think, as I remember, they had both of those options. I think they said in the depositions that they did.

Q You testified about the Hurford patent; do you recall?

A Yes, may I have a copy?

Q Am I correct that the Hurford patent shows only the display of a single spot or cursor on a television screen?

A Yes, I think that is right.

Q Is it the import of the disclosure that that will be applied at the television studio for purposes of emphasis and the like?

A Yes.

Q There is no disclosure of two or more symbols or of

any interaction of any kind between symbols; am I correct?

A No, but there is certainly an interaction between a man and a machine.

Q Didn't the French patent show a spot that was movable -- that is the French patent that is cited in the Patent Office record -- a spot that is movable at the TV station for the same purpose?

A I believe that is right, yes.

Q Isn't the French Patent just as relevant with respect to the claims in issue in this litigation as the Hurford patent then?

A I think both of these are showing interaction between a man by manual control and a television set.

Q The answer to my question then is yes, is it?

A I think it probably doubles the fact that there was a lot of this kind of art around, yes.

Q The French patent is just as relevant to the claims involved in this litigation as the Hurford patent; am I not correct?

MR. GOLDENBERG: Your Honor, excuse me. I do think that question is objectionable to the extent that it has legal overtones in it. There is perhaps a question that could be asked which elicits a technical view from the witness, but what is relevant in this litigation I don't think is for Mr. Holt to testify about.

THE COURT: You may be right technically, but all the witnesses have been doing this. They have been talking about what is relevant and what wasn't relevant. Perhaps that is a conclusion for the Court to draw ultimately, but in the meantime I think the opinions through the witness on this point are at least helpful.

So I will overrule the objection.

BY MR. ANDERSON:

Q Can you answer the question?

A Could I have the question repeated, please?

Q The Hurford patent is no more relevant or important than the French patent with respect to the claims of the two patents in suit; am I correct?

A I really couldn't answer that. As a matter of fact, I had only the French. I am a little rusty in my scientific French.

So I did work on that before the trial began, and I only got the translation a few days ago. I honestly can't answer that really to my own satisfaction. I have not studied their comparison enough.

Q Have you studied the Doba patent that is a file wrapper reference cited by the examiner and is in English?

A Yes, I have studied that.

Q Doesn't that Doba patent show a spot on the television screen that is movable?

A Yes.

Q Isn't that Doba patent, cited by the examiner, at least as relevant or important with respect to the claims in this litigation as the Hurford patent?

A I think I ought to answer as far as I know, yes, it is certainly a symbol which can be moved by an

operator. It is not quite in the same way, but it can be moved by an operator.

Q With respect to the Balding patent, about which you testified, one of the other references relied upon by the defendant, not by the examiner, teaches one fixed display or symbol which doesn't move and another that moves up and down, as shown as Sheet 2 of the Balding patent 3,122,607, is that correct?

A I have Balding '607 and Balding '756. Which one of those are you referring to?

Q '607, sheet 2 shows the display which Balding's Aircraft Device --

A Yes, I have it.

Q -- creates on a screen; am I correct?

A Yes.

Q That triangle shown stays in one place; am I correct, it doesn't move?

A I believe, from my recollection, that is correct.

Q The little bar above it doesn't move left or right, but does move up and down, is that correct?

A As I remember, the pilot was trying to keep his aircraft speed so it would just sit on top of that point.

Q That was just automatic. As he increased or

decreased the aircraft speed, that little bar moved straight up and down, is that correct?

A I think that is right.

Q That shows no direct operator control over the position of a spot left and right or up and down in Balding, does it?

A If we are going to have coupling means, they go all the way through an aircraft. So it is certainly not a very close coupling.

Q But it is a coupling, you agree, between the hand of the operator and the spot?

A It is not a direct wire.

Q It is not a direct wire, but it is a coupling?

A A pretty fancy coupling.

Q Through an airplane?

A Yes.

Q Isn't the French patent or the Doba patent at least as relevant or important with respect to the claims in issue here as the Balding patent that moves a bar up and down in response to aircraft speed?

A I personally believe that the circuit on Figure 1, your Honor, in this apparatus was the thing that most interested me about that because it was so similar to the slicer circuit at '507.

See, these two diodes back to back in

here made a big noise about them as being a very nice thing, and here is somebody that came along in 1962 and did that very similar thing.

So that really was what I was interested in.

Q The slicer circuit in the '507 patent is not in any claim that is being asserted against the defendants in this litigation; am I correct?

A I think that is right.

Q Now turn to the Balding patent Reissue 25,756.

Am I correct that this is a visual display on a TV-type screen?

A Yes.

Q It is to simulate the ground below an airplane?

A Yes, in Figure 12, for example, it shows a TV monitor down here in the bottom right-hand side. This monitor has an interesting feature in it, your Honor, which is not in normal television sets.

As I remember, this has a motor which rolls the yoke. You don't find that normally in a standard television set.

Q Is that the way in which the roll effect in the pictures on Sheet 1 of the Balding patent is generated, by rotating the yoke?

A The roll is described as presented by rotating the deflection yoke.

Q That particular feature is not involved in this action in any way, is it?

A I would object strongly if somebody called that a standard television receiver.

Q Because it has this rotating yoke?

A However, it does have raster and good things like that. Other than that, it is a good TV monitor.

Q Am I correct that there is no player or operator control that manipulates a symbol on the screen of the Balding patent, Re 25,756?

A You would have to go through the airplane again.

Q Just like the Balding '607 patent, is that right, in that sense?

A Yes, this is a lot fancier, but the object of this particular type of presentation is to have a pilot land his plane perhaps in very soupy conditions.

Q With respect to the claims that you have testified about that are in issue in this litigation, aren't the French patent and the Doba patent, relied upon by the examiner, at least as relevant or important to those claims as the Balding

patent re 25,756?

A I would like to look and see -- are we talking about '507?

Q And '598, yes.

A '507 is the same as '284, isn't it?

Q That is correct, and '598 is the same as '285.

A Doba is not referenced by the Patent Office in '284. I am looking here (indicating).

I don't see Fizo referenced in '284 patent either, Fizo being the French Patent.

Q Aren't both of those, the Doba patent and the French patent, cited in the '507 re-issue of the '284 patent?

I will show you the cover of the '507 patent.

A I see Doba. I don't see Fizo.

Q At the bottom, French patent 1,180,470.

A Oh, yes.

Q Isn't that also true of the re-issue 28,598, both the French patent and the Doba patent were cited by the examiner?

A It looks like it right on here, yes.

Q The same examiner handled all four of those patents, am I right, Mr. Trafton, if you know?

A I think that is right. I am not going to swear to it, but it is my recollection.

Q Mr. Holt, on direct examination you were asked: "From your understanding of the state of the art in 1954,

"did you have any --" page 1,707, I am sorry.

At page 1707 you were asked by Mr. Goldenberg:

"From your understanding of the state of the art in 1954, did you have any belief as to whether or not the University of Michigan pool game could have been played on a raster scan type of display?"

Following an objection, you answered:

"The program has been very slightly different. After having generated a full frame -- see, the computer went and calculated all of the collisions for one set of collisions, and then in the way they did it, they just put out the new positions to the cathode ray tube point by point."

Mr. Holt, is that the sequence in which it was done in Michigan Pool, and you understood Mr. Brown's testimony?

A No, Mr. Brown's testimony was not really detailed about this, but it was clearly a point by point display in the sense that the computer, when it had generated a new position for a ball, sent that out to an external kind of interface box, your Honor, which kind of stored this X-Y point for this.

Everytime that they could, they brightened it again, so that basically you have a computer here and you have a cathode ray tube over here, cathode ray tube not being very

sophisticated; but there was a box that was part of the Michigan output, the computer output, which could store things. It had memory in it and things like that and could put out information to the cathode ray tube.

It did this whenever it had a chance and when the cathode ray tube was not busy at something else. That would be a point by point display. It would go here and then here and then jump around and brighten the balls as fast as there was time for the cathode ray tube. That would be as opposed to if they had organized all of the new locations or all the ball locations in order as they were going to be displayed if they had a raster. In that case if the computer was going to do it, the computer would have stored them according to the time -- and I use the word time here because it is really according to the time that they would be required to brighten the screen.

Then it would put that in a memory, and those would again be cycled right through. As the cathode ray tube got to the right spot, it went "Bing" and brightend the screen. It went on and here is another memory time position coming in, and it says, "Hey, brighten it now."

So that is the contrast I am making. That could have been done.

Q Now, did Mr. Brown testify, as you understood it, that after every collision calculation with respect to a new ball, that ball was then put on the screen, and then the computer went back and calculated with respect to the next ball, and that was put on the screen? Isn't that what he said?

A I don't remember precisely what he said. I looked at the circuit myself independently and found that in the worst case you could display a new ball every two milliseconds, and that most of the time you could display them much sooner than that.

Is that answering your question?

Q No, it is not.

Am I correct that in Michigan pool or in the patent that Michigan set up on their MIDSAC, the computer calculated the collision calculations as to one ball, and then it displayed that ball, and then it went back and performed the calculations on the next ball, and then it displayed that ball, and in order to make the calculations and go back and display, it was necessary to spend roughly a half second maximum in doing that if all balls were involved?

A The answer to the first half of your question was yes, but the answer to the second half is no.

Q Now, the answer --

A In other words, after each calculation it did go and display that ball. I was trying to answer yes to that.

However, it takes a maximum of two milliseconds, the way I read the block diagram, and admittedly it is not very detailed, but from what I got out of the block diagram and the program, it was that each calculation for the ball could at the maximum take two milliseconds, then at that time you could display a new ball. So that you could display all 15 balls in 15 times 2 milliseconds in the worst case.

I think I know what you are going to go to, because it is true that if you are calculating all of the bounces off each other, that is not just 15 collisions. That is 15 factorial.

However, it is, and he said he did display it after each ball computation, which is what I said -- the difference here is that if you compute two balls hitting each other and then you display one of them, then you go back and compute another two, it may be one of the same balls came off of another one this time.

So if you have 15 balls to calculate hitting all of each other, that is a lot more than just 15.

But the point here is that you can, according to my reading of the program, display a ball once every two milliseconds or less, but that the entire calculation did take a lot longer than that, and I don't remember his number, 230 milliseconds, or something, for the whole calculation, when they were breaking.

Nevertheless, they were displayed at least as often as a ball every two milliseconds.

Q You say they were actually done that way?

A That is the reading --

Q Did you understand that from Mr. Brown's testimony?

A That is the reading that I see from the program layout there.

Q Now, Mr. Holt, under Tab 2 of Defendants' Exhibit 8 is a set of various data sheets and calculations. The last page is entitled, "Collision Calculations."

A I don't have a copy of this.

(Document tendered.)

BY MR. ANDERSON:

Q The last page of Tab 2 of Defendants' Exhibit 8.

Are those the collision calculations that were made by the computer, each cycle, in order to determine the new relationship to the balls?

A I think that is right.

Q And that was done with respect to every collision that occurred between any two balls, is that correct?

A I think so, yes.

Q And in your testimony about how Michigan could have put this pool demonstration on a raster scan, those same collision calculations were still involved, am I correct?

A I would think so, yes.

Q So that the sequence, as I understand it, that you have testified about, then, is that there would be a ball location in the computer memory in terms of X and Y, the vertical and horizontal location of a ball, and that would be withdrawn from memory periodically, processed with these equations, to determine what collisions occurred, processed with position, X and Y information, and the rate of change of X and Y information, and that would be updated and a new ball position would be put back in memory and stored, is that correct?

A That is an awfully long question. Could we take it one at a time?

Q Why don't you tell me what it involved in updating a ball position in the computer memory as you understand it in the Michigan demonstration of pool?

We now have a memory location in the memory of the computer, and I take it that it would be one of these Williams tubes, would it?

A Yes. That is a high speed memory. There is also a magnetic drum memory in the MIDSAC.

Q We have a memory location with a vertical position and a horizontal position stored with respect

to one ball, am I correct?

A That is one way of doing it, yes.

Q How was it done in Michigan pool? How was it done in the demonstration, as you understand it? That is the demonstration in 1954.

A The way that this rather fragmentary account points to it, and I do not have any personal knowledge of it -- I have read this material -- the way it would point to is that after the calculation of the new ball position was computed, that was sent to the magnetic drum area, which was reserved for output, and probably was displayed as soon as the cathode ray tube was not busy displaying something else.

Q And the information that was stored, whether it was on the Williams tube memory or the magnetic drum memory, was a vertical position and a horizontal position of that ball at that time, am I correct?

A I think that is certainly what is indicated is probably happening here.

Q In addition to that, was it necessary to store in that memory the vertical movement, the rate at which it was moving up or down, and the rate at which it was moving left to right, also in two different memory locations?

A Not to be sent to the display, I don't think.

Q I am talking about the memory.

A Well, you have a computation of the new ball position, an X and Y, and the simplest thing to do is to send that out to the display memory, and then to move the beam to that X and to that Y if you are going to have an X-Y plotter, which they did.

Q And then display the ball?

A And then display the ball.

Q Now, let's assume that in accordance with the computer program and the demonstration that ball is supposed to be in motion. How does the computer know and process the information with respect to the motion of that particular ball?

A The computer knows the velocity of the ball.

Q How does the computer know the velocity of that particular ball? Isn't it stored in the memory, of vertical velocity and horizontal velocity?

A Probably the high speed memory. It may be in the low speed memory.

Q It would have to be stored in the memory?

A Yes. Not for display, but to help the new calculation

Q It has nothing to do with display?

A Yes. You have that velocity, because the faster the ball is going, the further it is going to displace some other ball when it hits it.

Q And you would have to have, in order to display Michigan Pool, that vertical and horizontal position information and that vertical and horizontal speed information stored in some memory as to each ball, am I correct?

A I didn't go through that in that much detail. I certainly would think that you would have to do that.

Q And that would be whether it was an X-Y display, as it was actually done, or whether you used your additional capabilities that you are going to design into it to display it in some sort of raster scan? Am I correct?

A I would like to say we did the computation in the same way in both examples.

Q And you stored the same information in the same computer memory, whether you used the raster scan that you are proposing, or whether it was done the way the Brown testimony would indicate that it was done, using just an X-Y display?

A I think I would like to have you break up the question a little bit.

Q Sure. Am I correct that the computation, the stored information, with respect to ball velocity and ball

position for each of the balls in the Michigan demonstration would be identical whether the Michigan demonstration was, as it was, in fact using an X-Y point plotting display, or whether it used your proposal to substitute a raster scan?

A I don't think you broke up the question, but I think I got it this time.

Q If you understand it --

A I would like to say sure, that I think for the purposes of our argument that the computations ought to be the same. It is really a question of what you do to display it then.

Q So by going to your proposal to take this computer output and somehow order it and put it into time and relationship with some synchronization and display it on a screen would not eliminate anything in the Michigan pool demonstration at all. You would have to add things, am I correct?

A It would probably strain the capacity of the high speed memory, I will tell you. They might have had to pull a few more tricks in order to get a little space to sort them, but I think you would probably get away with two or three more memory locations in the sorting. Depending on how clever they were.

Q Two or three more memory locations for each of the spots on this raster that you are talking about?

A Well, here we have done, let's say, our calculation

of where the balls were going to be the same way, and Mr. Brown testified that they had a hard time squeezing that program into the amount of high speed memory he had.

So if we are going to add another computation, this sorting, putting them in order, we are going to have -- if we already run out of high speed memory, we are going to do a few tricks. We may, for example, have to transfer some of the other information into low speed memory in the meantime.

Q Low speed memory is the magnetic drums?

A Magnetic drums, yes. So we might have to get a little more clever in organizing the program, and it might cost us a little time.

On the other hand, we might pick up a good deal of time. We might pick that time up by the very fact that we were displaying these in a more reasonable way.

Q You have no idea at the present time what these clever techniques you refer to would be that would have to be added in order to do it with the existing memory?

A If you would give me time, I would love to get out and do this in detail with you, because this is a kind of challenge. I am not a programmer, but I can talk like one if I have to. I don't earn my living as a programmer.

Q All right. Now, you have testified that instead of doing the demonstration the way Michigan did it, you felt that the computer, and I will quote you at the bottom of page 1707, where you said:

"The computer is good at sorting things by the order in which they should be put on the television set."

Now, what are you sorting in your pro-

posed modification of the Michigan demonstration?

A Well, first you sort on the most significant digit.

Q What are you sorting?

A We are sorting the eventual location, so that if we say the earliest possible one is where X equals zero and Y equals zero, and the furthest one is X equals 256, let's say for a number and Y equals 256 --

Q All right. Let's use that.

A That distance can be considered a linear distance really.

Q X equals 256, Y equals 256 might be a point in the lower right-hand corner of the TV screen.

A Yes.

Q Now, explain, then, how you would sort this computer stored information in order to follow your proposal and convert it so that it could be displayed on a raster scan type of TV receiver.

THE WITNESS: Your Honor, this gets a little technical --

THE COURT: For a change?

BY THE WITNESS:

A But the most effective way to say it is that you divide everything into two parts, and when you have all these balls, the position of 15 balls, and we want

to see which one of them is going to be shown in time the first, and which one the second, you first of all say all the balls on this side are going to be in the second half of my time, and all the balls on this side are going to be in the first half of my time, and then you take this left half and separate them again. You take the right half and separate them again.

Now you have four sections of time, and you keep on separating these balls that are left over in these little pieces -- in other words, I have two balls that are in the first quarter of my time, no balls in the second quarter, and I have seven balls in the third. So each one of these -- I was dividing my time into four sections by now.

BY MR. ANDERSON:

Q Let me stop you there.

A Then I keep dividing it down until I get it down until which one really is first. This is the most efficient method of sorting by computers.

Q And you would go through all of that in order to get information as to where the ball should be in some sort of sequence?

A That is correct. Yes.

Q Would that just give you a sequence, then, of where the balls would be, which one would come first,

if you were going through the scan?

A Yes. But, of course, all I have done so far is to put them in time order. I haven't said yet where they are going, where we should brighten the screen. To do that, we have coincidences that are set up in order to blacken the screen, and the memory still has got to be in there.

Q You have to have time coincidences, such as are taught in the '507 and the '598 patents, in order to display the spots, am I right?

A Time coincidence, whether you call it time or binary coincidence, is really unimportant. You still have to know where the ball is going -- a memory has to be there telling you what horizontal position you are going to brighten it and also what vertical lines.

But you now have them in order. You now have got to have coincidence of the data which tells that the ball is going to be in the fourth slot horizontally and the ninth line down. That is going to be our first ball.

So you have to have a counter, counting lines, and then when it gets up to 9, which is what I said it had to be, that says, Hey, somewhere on this line you are going to brighten that.

Then when the horizontal counter gets up to four and that matches what is in my memory, then you say, Whoops, I have got coincidence between my vertical counter and my horizontal counter, so brighten the screen.

Q Am I correct that you would have to provide that counting information so that you would know whether to brighten every one of, say, 60 or 100,000 spots on a television display?

A I would appreciate your trying the question in a little different way. Not quite to repeat it, because I don't think I understood your question.

Q If I understand your proposal here on how to modify the Michigan pool demonstration, you are saying now that as this new piece of raster scan equipment you are putting in place is stepping across and building up a picture, there is going to be a discrete address for each spot on the entire screen, each possible place that you could illuminate, is that correct?

A We call them a pixel, which is an abbreviation for picture cell, your Honor.

Q So if your particular display that you are going to build into the Michigan demonstration used 256 lines and was capable of 256 discrete illuminated points across the line, that would be, roughly, what, 60,000 to 65,000 pixels, is that correct?

A 256 by 256, yes.

Q And that is something in the order of -- I didn't multiply it out. 60,000 or more?

A Yes. It is up there. Multiplying them out.

Q As to each of those pixels, you are going to somehow determine by going to this sort of data whether or not there should be a spot lighted there? Is that what you are saying?

A I think I know what you said. Maybe I can explain it. It is possible to light each one of these spots, no doubt, and I have only one set of equipment which does that job. This set of equipment tells me where the beam is on the display, and this equipment tells me where I want to light it, and when these match up, then I say, light it. And that can happen at every one of these pixcells with a modest amount of equipment.

Q Am I correct that in order to display even in this picture that you are proposing, which would be 256 lines by 256 illuminated locations, that you would have to provide information about sixty plus thousand spots for each refreshed cycle of this display, each time we are going to make a new picture?

A No. In general we are going to store eight bits for X and eight bits for Y for 15 balls.

Does your Honor remember what a bit is? It is the smallest unit of information. It is one count. Remember we were counting things? So if I go from count 3 to count 4. Effectively a bit is the smallest amount of information that would appear; so to store 255 by

256, I have a number which has 8 bits in the X frequency and 8 in the Y. I have to have 15 sets of these, one for each ball.

Now, that will give me -- if I have a memory which can store 15 numbers each of 16 bits, I have to 8 to save for each ball, and if I have a memory which can store 15 of those double numbers, I now can use that memory to display those 15 balls, and it again is a modest memory. It is not a large memory. It is a total of 15 times 16 bits, which is a little over 225.

Q In 1954 wasn't the raster scan that you are hypothesizing much too fast for the computer capabilities of the MIDSAC computer?

A No, sir. It really doesn't make any difference. In 1951, for example, I was using raster scan to examine the characteristics of the Williams tubes. Williams tubes had bad spots on the face of the tubes so we used continuous television type scan on the Williams tube and picked off from the front mesh a signal, and we had another laboratory oscilloscope which was just going the same old television raster, and on the intensity access, the thing that brightened it, we would put a signal that was a function of how good the tube was, the secondary emission ratio.

So we had this Williams tube not operating as a Williams tube this time, but being examined for goodness.

Over here we had an image of the secondary emission ratios. In that way we were able in 1951 to observe what was probably worked as a good Williams tube or not.

Q Mr. Holt --

A The speed of these things was no problem at all. We are going to scan the thing, if you are going to use interlaced fields, which was a common television practice -- we did not use an interlaced field back then. But we would use a new complete scan, let's say roughly 1/30th of a second, and if you did it at 1/30th of a second, it would tend to blink a little

here. But the speed is no problem, because we would go through -- well, that is 30 milliseconds, after all, and we were able to get through these spots in good shape at that time.

Q Didn't the Williams tube have a persistence such that once you eliminated it once, it held the lighted image, the illuminated image, for several minutes?

A No, sir. The Williams tube did not operate on the phosphor per se, and the light output was merely coincidental.

Now, we do take pictures of those, but the important part operationally was the secondary emission ratio and how it was redeposited inside the tube.

The phosphor has nothing to do with the memory.

Now, my thing that I did in my thesis did have to do with the phosphor.

Q Mr. Holt, in the patents in suit, the '507 and the '598 patents, there is no addressable memory storing horizontal and vertical position information and horizontal and vertical velocity information and performing collision calculations on it as used in the Michigan demonstration of pool, am I correct?

A There is no counters and things like that in there.

Q Am I correct that there is no addressable memory, storing vertical position or horizontal position information, vertical velocity information and horizontal velocity information, as were used both in the Michigan demonstration and in your proposed change?

A The wall generators certainly stores positional information.

Q The wall generator stores positional information in terms of the relationship of time between the sync pulses and the wall pulses, is that right?

A I know what I mean, and I think that is what you mean, too.

Q All right.

A In other words, the wall generator does store a time relationship between a horizontal and a vertical, between the vertical sync and the place that you want to display the wall.

MR. ANDERSON: Please read my prior question, and I would like the witness to answer it if he can.

BY MR. ANDERSON:

Q That is the question about memory locations, addressable memory locations, for the horizontal position and the vertical position of a particular ball, the horizontal velocity and the vertical velocity located in two different memory locations.

There is nothing comparable to that program or memory storage in either of the patents in suit, am I correct?

A Well, your integrators, which are shown there -- as a matter of fact, they are shown on there (indicating) -- are an analog memory. However, I think I am going to give you the point. It certainly doesn't have the kind of addressable memory that a computer-driven display might typically have.

Q Am I also correct that there is no mathematical equation stored in an arithmetic unit, as in the Michigan demonstration of pool, in either of the patents in suit?

A I am sorry. I was still thinking over something else.

MR. ANDERSON: Read the question.

(Whereupon the record was read by

the reporter as requested.)

BY THE WITNESS:

A That is correct.

BY MR. ANDERSON:

Q And those last two questions are equally true of the accused games, am I correct? Your answers are equally true of the accused games?

A Well, your Honor, it gets to be a little -- I think I want to give him his point, but I think there is a distinction here, that all of these machines, the plaintiff's games and the defendants' games, have a program in them.

Now, they are not a general purpose program in the sense that the big machines were. They are fixed programs or nearly fixed, and the fact that these things are wired together, well, I could argue for a while that that was a program. I don't feel that I need to argue that, but some people might.

Q Then you are not arguing that that is a program?

A I think it is begging the point. But some people might call that a program, a fixed program, a wired program. There are other much more important differences which are clear.

Q Now, Mr. Holt, the parties to this action

have stipulated, have agreed to, a definition of television receiver. That definition reads:

"A device for receiving television signals in a standardized form, separating those signals into their various parts, the video and synchronizing signals, and using the signals so separated for displaying images on the screen of a television picture tube."

That is at pages 17 and 18 of the stipulated glossary.

Have you read that before?

A Could I have a copy, please?

Q Sure. Let me take mine out. That is pages 17 and 18 of the agreed glossary.

A Which one did you want me to --

Q I read to you the definition of "television receiver".

(There was a brief interruption, after which the following proceedings were had herein:)

THE WITNESS: Okay.

MR. GOLDENBERG: Your Honor, I think the Court should have in mind that this stipulation was entered into between counsel and was represented to the Court as representing the understandings of the attorneys.

THE COURT: I understand.

MR. GOLDENBERG: And therefore it is not the testimony of any witness in this lawsuit and it should be approached with that in mind.

BY MR. ANDERSON:

Q Mr. Holt, you heard Dr. Ribbens give his definition and testify that his definition is consistent with the agreed definition.

Do you agree with that, that his definition is consistent with the stipulated definition?

A I really can't, because the standard form --

Q Let me ask you --

A The standard form of sending television signals is

as an RF signal. Anything else is a very unusual case.

Q Mr. Holt --

A And therefore the standardized form -- if this said "The standardized form", then "the standardized form" indeed requires a front end to it.

Q You mean then you would agree with it, if it said "the" standardized form?

A I would say that something like 99.99 percent of all signals that get displayed on a television tube, a picture tube, have come to that by means of the airwaves, not by some other method, and that to get them that way you would have to have an RF section on it and an IF section, and furthermore this is the common understanding of people in the business.

Q With your one suggested change, would you personally then agree with the definition that the parties have agreed to?

A No. I wouldn't have at all.

Q I'm sorry? I misunderstood you, then.

A I wouldn't have agreed to the stipulation. I was not asked.

Q You have suggested a change in the wording. The question is with that change in the wording, with the change you are proposing, could you accept the definition?

A For receiving television signals in their normal form.

Q Getting back my original question, you heard Dr. Ribbens say that he believed that his definition was completely consistent with the agreed definition?

Now, do you agree that Dr. Ribbens definition of a television receiver was completely consistent with the agreed definition at pages 17 and 18?

MR. GOLDENBERG: Your Honor, if the witness is going to be asked this question, he ought to be shown by reference to somewhere in the record where Dr. Ribbens gave his definition.

THE COURT: Yes. I think that is so.

(There was a brief interruption, after which the following proceedings were had herein:)

MR. ANDERSON: Would it be appropriate to take a short break, your Honor?

THE COURT: All right.

(There was a brief recess, after which the following further proceedings were had herein:)

BY MR. ANDERSON:

Q Mr. Holt, at page 1222 of the record, Dr. Ribbens was asked:

"According to that definition, and I will read it, 'A television receiver is a device for receiving television signals in a standardized form, separating those signals into their various parts, the video and synchronizing signals, and using the signals so separated for displaying images on the screen of a television picture tube,' do you agree or disagree with that definition of a television receiver?

A I agree."

Mr. Holt, on direct examination at page 1679, you were asked:

"Q All right, sir, do you have any view with respect to whether or not there are any distinctions between TV monitors and TV receivers?

A This is a place where I really think

"that Professor Ribbens shouldn't have done it because there are terms that have been in the field for such a long time, since 1950."

Mr. Holt, do you have any specific disagreement with the agreed definition between the parties of the definition of a television receiver?

A Yes, I do.

Q Does the stipulated definition include a monitor, as you understand that term monitor?

A Did you take back your copy?

Q I am sorry. I took back my copy.

A I don't have it in front of me, but to speed things up, I think that is right, that that definition probably does include a monitor.

Q Now you have looked at that definition, is that your testimony?

A Yes, except that any definition ought to be broad enough so as to give you the overwhelming majority of the kinds of things we are talking about. The absolutely overwhelming majority of television receivers, I mean, the term itself to any engineer that I could bring around would mean it actually picked off signals from the air.

Q This definition, the agreed definition, and Dr. Ribbens' definition satisfies your statement that

it includes the vast majority of television display equipment?

A No, this definition here does not go to the meat of the issue that a television receiver is to receive common garden variety television signals and it does not stipulate that that is what television receivers are commonly understood to do.

Q Mr. Holt, isn't the agreed definition of television receiver completely consistent with the disclosure of the two patents in suit?

A I don't think so.

Q Do you find anywhere in the '507 patent or the '598 patent anything that precludes the agreed definition or Dr. Ribbens' definition of television receiver?

A Yes, don't all of these diagrams --

Q Would you point out where in the patent --

A -- we have been looking at say RF modulator?

Q You said the vast majority of television receivers include a RF modulator; am I correct?

A No.

Q The vast majority of --

A No, television receivers do not include a RF modulator. They include a method for taking RF and de-modulating it, just the opposite.

Q I am sorry; they include a RF demodulator.

A But these drawings here of the plaintiff all show the fact that they are going to be going into a television set which has a standard receiver. It can receive broadcast signals over the air, and that is what is shown in all your own drawings.

Q All of the drawings in the two patents in suit or just certain ones?

A Everything that I see right in front of me.

Q Aren't there drawings in the patents in suit that show the games hooked up to a TV monitor as you have used that term?

A I believe that the reissue patents, because it was not perhaps discovered that they needed to say a cathode ray tube, that those claims, for example, were added when they decided that the term standard television receiver did not really cover a cathode ray tube that didn't have any method for receiving broadcast signals.

Q Mr. Holt, isn't it a fact that some of the drawings in the patent in suit show what you have referred to as a TV monitor?

A I think I remember seeing some drawings.

Q In fact, I think you said you had a piece of equipment with a switch where you could use it to receive standard broadcast signals in one switch position

and throw it down in the other position and it functioned as a monitor. Do you remember your direct testimony on that?

A Yes, a rather unusual piece of equipment in terms of the general public; yes, I have one.

Q That is what I understood.

The patents, and particularly '507 patent, specifically show that kind of a monitor that you say you have used; am I correct?

A Could you refresh my memory?

Q Fig. 18A, Mr. Holt, the re-issue patents 28,507, and that is the same in the '284 original patent, Fig. 18A.

A Sheet 12 of 16?

Q It is Sheet 14 of 16 in the re-issue patent.

A I am on the '284.

Q It is Fig. 18A. Do you find Fig. 18A?

That is it. If that switch 201, 202, and 203 in Fig. 18A is thrown to the down position, isn't that functioning as the monitor that you said that you have personal experience with?

A Yes, sir.

Q Is there anything in the patent, either of the patents in suit, which is inconsistent or precludes the agreed definition of television receiver?

A I am sorry. I got tripped up.

Q Is there anything in either patent that precludes the definition of, quote, "television receiver," unquote, as the parties have agreed to it and Dr. Ribbens has testified?

A I think it violates standard understanding in the industry.

Q Is there anything in the patents, the two patents in suit, which are inconsistent or precludes the definition that the parties have agreed to?

A I don't know any particular part that precludes that.

Q In the patents, for example, in the re-issue patent 28,598, which is also in the original patent '285, there is a statement at column 22, line 44, which says:

"A television receiver can be made just for television gaming in the manner set forth in said application serial number 828,154, whereby the output of the OR Gate would be applied to a video amplifier to intensity modulate a cathode ray tube, the output of the horizontal and vertical sync generators being applied to the horizontal and the vertical deflection circuitry."

Now, that specifically says a television receiver can be made just for gaming apparatus and that the signal can be applied directly to the video amplifier.

Do you agree?

A I think we have to decide -- some of the claims say standard television receiver, others say television receiver, and others say cathode ray tube. I think it is perfectly all right. I don't see why we really should have to argue about this.

I think we all understand each other that, by

overwhelming understanding, any competent engineer would say a television receiver or a standard television receiver has what we call a front end. This is the generic term for it, and if you mean something doesn't have a front end, you say so. You say monitor or something like that.

Q In the context of this lawsuit, they are all the equivalent; am I correct?

A No, I don't believe it. I think that every patent has to be read with respect to the art that it is being built with.

THE COURT: Mr. Anderson, that passage that you read, was that from '507?

MR. ANDERSON: No, your Honor, it is from '598, at column 22, line 43, your Honor.

THE COURT: Was that in '285?

MR. ANDERSON: Yes, your Honor, it was in there in exactly the same language, unchanged in '285. It starts at line 41 or 42 of column 22. It is in the middle of a paragraph.

Excuse me. I am wrong on the line. It starts at about line 44, the middle of the line in the middle of the paragraph, "a television receiver can be made just for television gaming".

THE COURT: Where is it in '285? Can you locate it there?

MR. ANDERSON: Your Honor, I am sure we can find it.

It is at column 18, line 52.

THE WITNESS: Could I have a copy? I don't have very much up here. Could I have a copy of '285 or '598?

(There was a brief interruption, after which the following proceedings were had herein:)

THE COURT: What is that '154 application that is referred to there?

MR. ANDERSON: That is the '507 patent, your Honor.

THE COURT: That is the '507?

MR. ANDERSON: Yes, and the '284 original patent.

THE WITNESS: Mr. Anderson, where was that in the '598 patent?

MR. ANDERSON: It is in column 22, line 44.

THE COURT: Is the same statement in '284?

MR. ANDERSON: Your Honor, a very similar statement is in '284 and the '507 patent. It describes the same structure, but it does not use the words "a television receiver" at that point in the specification.

THE COURT: Could you find that for me in '284 and '507?

MR. ANDERSON: Yes, your Honor. In '507 it is at column 20, beginning at line 47. It says:

"In a further embodiment --" and I am quoting -- "In a further embodiment of this invention, a unit is set forth which is used solely for TV gaming and does not have capabilities to receive broadcast programs."

THE COURT: Where is that now? I am sorry.

MR. ANDERSON: That is in Reissue Patent 28,507, column 20. It is the beginning of a paragraph in this case, at line 46.

THE COURT: Yes, all right. Then that is also found in '284?

MR. ANDERSON: Yes, your Honor, in exactly the same language. It appears in column 17 in the '284 original patent, a little separate paragraph beginning at line 12:

"In a further embodiment of this invention, a unit is set forth which is used solely for TV gaming and does not have capability to receive broadcast programs."

THE COURT: All right, thank you.

BY MR. ANDERSON:

Q Mr. Holt, at page 1735 of the record you indicated that the '507 patent uses flip-flops. Do you recall testifying about flip-flops in the '507 patent?

A Yes, as a matter of fact the important one is right in front of me. It is 122, your Honor. That is, I think, an important flip-flop in this drawing 12A, part of the '507 patent.

The flip-flop there is used to reverse the motion of the ball horizontally.

Q I think you testified at that point that a flip-flop is a computer circuit.

A flip-flop is a much more generally applicable circuit in electronics than just computers, isn't it?

A A flip-flop has a very, very -- it has no analog features. A flip-flop is entirely what I would call a digital computer like device. Its voltage inputs and outputs are standardized levels. It doesn't measure any parameters, any voltage or current, other

than just going past a threshold, which is again characteristic.

Q It has two binary states, is basically what you are saying?

A Two binary states, yes.

Q Therefore, you consider it to be a part of computer technology for that reason?

A Yes.

Q It predates the computers, as we know them today, doesn't it? It was an outgrowth of the Echles Jordan circuit?

A Echles Jorden circuit is, I think, the basic flip-flop.

Q It is "the" flip-flop, and that goes back prior to 1947?

A Yes, yes.

Q Digital computer technology as we know it started sometime after '47?

A ENEAC, of course, was during the war, and they used flip-flops for memory. As I remember, they used four vacuum tubes in a flip-flop then to store one bit of information. It was pretty expensive.

Q But Echles Jordan long preceded ENEAC?

A Yes.

Q It is a tool of an electrical or electronic

engineer, not necessarily just for computers; am I correct?

A Sure, that is all right. It is one of the things we had to play with.

It is not an analog circuit, though, in the sense that I am distinguishing between analog and digital.

Q You testified that the accused games are in some definition a computer. Is that your testimony, that the accused games are computers?

A One can certainly analyze them as descending from the general purpose computers into a special purpose computer, and it is easy for me to buttress that.

Yes, the accused games can very easily be described as being a special purpose computer.

Q Have you read the agreed definition of computer in this lawsuit?

A I think I looked at that.

Q The accused games are not computers as defined in our agreed set of definitions, is that true?

A Could I have a copy of that stipulation?

Q Yes.

Mr. Goldenberg, can you give the witness a copy?

I will read it to you.

MR. GOLDENBERG: I think if the witness would like to have a copy --

THE COURT: Why don't you just let him read it. It is pretty long.

THE WITNESS: Do you have a page number for me?

BY MR. ANDERSON:

Q Page 7.

A Yes, I have it.

What was the question, please?

Q Does the accused game Paddle Ball satisfy the definition of computer as agreed to between these parties in this litigation as set forth at page 7 of the glossary?

A Certainly as a special purpose computer, it does.

Q Does it include a central processing unit for performing arithmetical logical functions?

A We have some adders. We do find an adder. That was certainly an arithmetic function, and the logical functions are spread all over it.

Q In the accused game are you saying that there is a central processing unit as defined in this definition of "computer"?

A I am saying that there are arithmetic processes that go on there, and the question of whether it is a simple processing unit, it is pretty centralized. As a matter of fact, that particular adder is only one chip. That is pretty centralized.

Q Now, in your testimony about how you would change Michigan pool to use a raster type of display, you would add some sort of means to drive a horizontal sync pulse signal and a vertical sync pulse signal to apply to your raster scan, am I correct?

A I think so.

Q And you said you would use some sort of comparitor to compare a series of timed pulses beginning with horizontal sync with data about a particular ball, and when you had enough pulses, that would tell you to display that point at a given location, on a screen, is that correct?

A Yes. Basically, your Honor, you start off -- you

know this is the line that is supposed to be in your counting pulses, just like counting the lines on that string we had, count them up until you get to nine pulses and then go "Bing", assuming you are already on the right horizontal line.

Q So the comparitor is a means for generating a pulse representing the video information or paddle timed relative to the horizontal sync. That is what your comparitor is doing, am I correct?

A It is counting pulses, and, as a result -- well, it is also a length of time. The way it is done is by counting pulses.

Q So the information you have added, I mean the equipment that you have added, performs that function.

A I will give you something more. In 1954 I could have done it -- I could have developed this master scan from the Michigan pool using analog circuits also perfectly well.

Q In a similar way, I take it?

A Yes.

Q Add a comparitor of some sort, a horizontal sync source and a vertical sync source, and use a comparitor and a horizontal and vertical sync source to get time sources representing where the balls and paddles should be or where the balls should be in the case of pool, is that right?

A May I say it in my own words?

Q Is that an unfair characterization?

A I would rather say it in my own words, because we could have presented this thing as a series, and we have got this list that the computer put in order, and instead of us putting them out as "go six counts", it could have said, "Okay, starting from the horizontal sync, wait two milliseconds before you turn on the pulse." In other words, time.

And I could have had circuits for generating two milliseconds, which could have been done in an analog way; and from that point, by incremental work, it could have said, "Okay, now wait three milliseconds from that time and put out another pulse."

So I could have done it both by counting mechanisms in 1954 or by more direct time measurements, which would be closer to analog. It could have been done in either of those ways; and within those general areas the detailed circuitry, of course, could have varied a lot.

Q Now what you are adding, then, in your testimony is your speculation, is actually what is taught in the '507 and '598 patents as a horizontal sync generator, a vertical sync generator, and comparitors to locate the player, and the ball, but, of course, in Michigan pool it wouldn't be players, they would just be balls.

That is what you are adding, am I correct?

A Oh, characteristically the circuits did tend to go down through the Space War and through Pong and as digital circuits, not as analogs.

Q That is not my question.

You said it could either be an analog or digital as far as you were concerned in your redesign of the Michigan computer to display the pool demonstration on a raster scan.

What I am saying is what you have added here today to the Michigan demonstration of pool is a vertical sync generator, a horizontal sync generator, a comparitor to locate a ball or several balls, is that correct?

A I don't see any reason for confusing it, sure. That's right. I think in the analog version that is what I was doing, sure.

Q And in the digital, you are doing the same thing, but you are doing it digitally?

A It is different means and different operation, and

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in detail different results, but the results would be close.

Q And they were a matter of choice, you are saying?

A Yes. And, of course, we do remember that the ball motion in the digital game is very much different from the ball motion in the plaintiff's games.

THE COURT: Are you going to go on to another subject?

MR. ANDERSON: Yes.

THE COURT: This would be a good time, I think, then, to break for lunch.

How much longer to you expect to require?

MR. ANDERSON: I will try to cut it to a bare minimum, your Honor.

THE COURT: All right. There will be some redirect and some recross, I am sure.

Would you think that Mr. Holt would be off the stand in another hour and a half?

MR. ANDERSON: I would think so.

It depends, of course, on how much Mr. Goldenberg --

MR. GOLDENBERG: I would think so.

MR. ANDERSON: I think I would have maybe a half hour at the most.

THE COURT: All right.

I am wondering what is the best method.

We could try to finish the case today and have me decide it today as well.

I think I would have a little more time to spend with these documents if we just finished the arguments today, finished the testimony and the arguments, and then were to come back on Wednesday morning, and I will give you a decision at that time.

Are you going to be out of town?

MR. ANDERSON: I was supposed to be in New York.

THE COURT: All right.

MR. ANDERSON: Thursday or Friday?

Previously Mr. Goldenberg and I kind of tentatively agreed to limit our arguments to an hour and a half.

Do you think we can still do that?

MR. GOLDENBERG: I was attempting over the weekend to organize my argument --

THE COURT: I do not want to limit you artificially.

I want you both to have an opportunity to say what you wish. I will try to get as much of this read over the noon hour as I can and we will keep going and see how it works out.

If not, then we will just find some time next week, maybe over the lunch hour or something.

I am going to start that other case now, but I can work this in over the lunch hour.

MR. ANDERSON: Your Honor did suggest the possibility that you would pose some questions.

THE COURT: Yes. I have reviewed some of this material over the weekend, and the more I review it, the less I am inclined to lay out anything in advance.

My questions really are broader than I had anticipated they might be.

I am sure I will ask questions as you go along, but as far as laying out anything in advance, it is not going to be quite that easy.

MR. GOLDENBERG: Do I understand, Mr. Anderson, there is a possible schedule whereby we will be completing the case today, which would include the argument?

THE COURT: Yes.

MR. ANDERSON: I think that is very possible.

THE COURT: Then I may be able to decide it today.

I think I will be able to, if I can call a recess after the arguments are over and get my thoughts in order and get things organized.

Let's come back at 2:30.

(Whereupon the trial of the above-entitled cause was adjourned at 12:40 p.m. until 2:30 p.m. of the same day.)